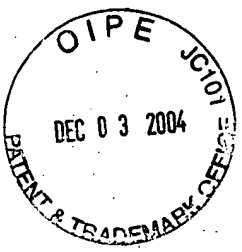

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RESULT	OK

FISH & RICHARDSON P.C.

225 Franklin Street
Boston, Massachusetts
02110-2804

Telephone
617 542-5070

Facsimile
617 542-8906

Web Site
www.fr.com

Date July 27, 2000

To Doug Woodnorth
Duracell Inc.
Duracell Worldwide Technology Center
37A Street
Needham, MA 02194
Telephone: (781) 449-7600

Facsimile number 08935-22600001 / (781) 449-7613

From John J. Gagel

Re M-4934
Our Ref.: 08935-226001

Number of pages including this page 16

Message Doug -- Here is a first draft of the patent application. Please give me a call after you have reviewed it. -- John

cc w/enc: Paul Douglas

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-- DRAFT --

UTILIZING PORTABLE ELECTRIC POWER SOURCES

TECHNICAL FIELD

This invention relates to utilizing portable electric power sources.

BACKGROUND

A battery is a typical portable power source. Batteries are usually purchased by a user who installs them in an electrically powered device. When a battery is completely discharged, it is most often discarded and the user buys a new one to replace it. In the case of rechargeable batteries, the user also buys a charger. The charger is an adapter that allows the user to recharge batteries using power from a low cost source, such as a commercial power generator. Rechargeable batteries can be charged a finite number of times before they too need to be replaced. The chargers as well have a limited lifetime. When the rechargeable battery or charger is no longer operable, the user buys another. The sale price of the battery or charger is based on the cost of manufacture. The manufacturer's profit is the price at which the battery or charger is sold, less manufacturing and business costs.

SUMMARY

In aspects, the invention features providing a battery to a user, and communicating the usage to a remote monitor, which may, for example, bill the customer fee based on the power usage. The battery may be provided to the user at low cost or even free, for example, as loaned equipment. As a result, the cost and convenience of battery use, particularly rechargeable battery use, can be enhanced for both the user and the manufacturer. The user's cost is based on the usage of the portable power equipment, the battery and perhaps a recharger, rather than the purchase cost of the equipment. The manufacturer's cost is based on the cost to loan the equipment. In the case of rechargeable batteries, this cost is greatly reduced compared to single-use batteries since the total power delivery over the lifetime of a rechargeable battery is many times that of single-use batteries, while the manufacturing and other business costs are typically comparable. In addition, communicating usage information and then billing based on usage, makes more practical charging stations located in a variety of settings, thus freeing the user from transporting a charger. For example, public charging stations, such as in airports, lodging establishments and the like, become practical since the

use of power and space in a public setting can be communicated, recorded, and factored into the cost of providing the power.

[Summary to be completed when the claims are finalized.]

Other features, objects, and advantages follow.

DESCRIPTION OF DRAWINGS

FIG. 1 is a schematic illustrating a battery usage communication system;

FIG. 2 is a more detailed schematic illustrating a system using a rechargeable battery and a charger;

FIG. 3 is a schematic of battery operation module to facilitate usage communication, while FIG. 3A is a schematic of the recharger module, and FIG. 3B is a schematic of a usage monitor module;

FIG. 4 is a flow diagram of the operation of the battery module and charger module;

FIG. 5 is a flow diagram of the operation of a usage monitor; and

FIG. 6 is a schematic illustrating systems utilizing various communication modes and charging sources.

Like reference symbols in the various drawings indicate like elements.

DETAILED DESCRIPTION

Referring to FIG. 1, a battery usage communication system includes a battery 2, which may be installed in a device such as a cellular phone 4, and a remote usage monitor 6. The user 8 may receive the battery and/or the device 9, for example, in the mail, at a low or no cost. As the device is used, the battery is discharged. The power usage is communicated 10 to the remote usage monitor 6. The monitor can then send a usage-based communication 12, for example, a bill, to the user.

Referring as well to FIG. 2, the system may include a device with a rechargeable battery 20 and a charger 22. The battery 20 has a power production portion 24, including a recharge port 23, and module 26 for facilitating communication of usage information. The charger 22 has a recharge port 28 which mates with the battery port 23 and connects 29 to an outside power source, such as a conventional wall socket. The charger also includes a charger module 31 which includes a connection port 32 which mates with a connector 30 to the battery module 26. The charger module 31 is also connected to a communications port

34 which mates with a connection to a communication channel, such as a telephone line for communicating usage information to a remote usage monitor. **[Doug - can you provide more detailed drawings of battery/charger construction?]**

Referring as well to FIG. 3, the battery module 26 includes a number of submodules, including a battery identification module 40 that identifies the battery and a device identification module 42 which identifies the device in which the battery is being used. The battery module 26 also includes a battery device verification module 44, which senses whether the battery is installed in a compatible or authorized device. The verification may include a verification logic which compares the device identification and battery identification to a table of permissible battery-device combinations.

The battery module also includes a usage detection and storage module 46 that provides a measure of the power discharged from the battery and stores this information. The measure of power discharged may be a measure of the actual power output, for example, by measuring watt-hours, or it may be an indication of the number of times the battery has been recharged. The usage may also be based on the usage of the device, such as the on-time of the device or the number of times the device has been turned on and off. The measure of power discharged may also be an indirect measure, such as the amount of time that the battery has been installed in the device, with power usage being calculated from an assumed or estimated rate of device usage.

The battery module 26 also includes a communication module 46 to communicate the usage information. The communication module 46 may include, for example, a modem to permit transmission of data over a conventional phone line. The battery module 26 also includes a disabler 50 which can disable further use of the battery or device. For example, the disabler may disable the battery or device if the battery is not installed in a permissible device as determined by the verification module. In this way, if the battery is removed by an unauthorized user, it cannot be used in a random device. The disabler may be made programmable by the user to permit use in selected devices or may be programmable remotely through a communication from the battery owner/manufacturer.

Referring to FIG. 3A, the charger module 31 also includes a number of submodules. In this example, these include a communication module 52 which permits communication of usage information to the usage monitor. The communication module 50 includes a connection to a communication channel, such as a phone line and may include a modem.

The charger module also includes a charger identification module 54, which identifies the recharger, a device/battery/recharger verification module 56, and a disabler 58. The device/battery/recharger verification module 56 compares the device and/or battery identification and the charger identification against permissible combinations and activates the disabler 58 if an attempt is made to recharge an unauthorized battery or device. The verification module 56 can be programmed by the user or the owner/manufacturer to only permit selected devices or batteries to be charged using the charger . The verification module may also send a communication to the usage module when an attempt has been made to perform an unauthorized recharge so that the usage module can then notify the user that the attempt has been made and that the recharger has been disabled.

Referring as well to FIG. 3B, the usage monitor 6 also includes a series of submodules. In the embodiment illustrated, the monitor includes a communication module 60 to receive communications, including usage information from the recharger module, and tosend communications to the user or to other parties. The monitor 6 also includes an account storage module 62 which stores the received usage information for each battery and/or device. For example, the information may be stored in an account file for the device/battery/user, which may also include payment history and other data, such as usage patterns. A billing module 64 initiates a billing function based on the usage information. The billing module may, for example, transmit a bill electronically to the user back through a device in which the battery is installed or it may signal a conventional billing system which assembles a bill that is communicated by mail. Alternatively, the billing module may charge against a third party account such as a credit card or a debit account.

The usage monitor also includes an analysis module 66 to analyze usage and other data. For example, the analysis module may monitor the historical usage of the device, battery or the charger. When the device, battery or charger approaches the end of its life, the analyzer can execute a communication to the user that it is time, for example, to obtain a new battery or a communication to a battery provider indicating that a new battery should be provided to the user. The analyzer can also utilize the billing data to, for example, provide discounts to certain user classes, e.g., heavy users, or offer premium services such as improved, newly developed battery or recharger technology.

Referring to FIG. 4, the operation of the battery and charger modules at the time of recharging is illustrated. When the device or battery has been assembled on the charger, a

communication link with the usage monitor is established 68 and identification information is communicated 69 to the monitor. The system first determines 70 whether the monitor has sent a disable communication. If a disable communication has been sent, the battery, device and/or charger is then disabled 72. If no disable communication has been received, then the usage is communicated 90 to the monitor and the recharge proceeds 92. In embodiments, before establishing the communication link to the monitor, the system may determine whether the usage should be communicated to the monitor. For example, if the usage has been minimal or if les than a predetermined time period has passed, the usage is not communicated to the monitor and the recharge proceeds. By not communicating usage in short time frames, for example, less than 10% of a billing cycle, or small usage amounts, for example 5% or less of the battery capacity, communication traffic is reduced.

Referring now to FIG. 4A, the operation of the usage monitor is illustrated. The usage monitor receives communication from the charger including the battery/device/recharger identification information 94 and the usage information 96. The usage information is correlated based on the identification information with the user and the usage information may be stored in a user account. The identification information is verified 94. If the battery /device/recharger identification does not represent an authorized combination or if for some other reason a disable is warranted, e.g., a delinquent payment, the monitor sends 100 a disable instruction to the recharger to disable the battery and/or the device. The monitor may also send a communication notifying the user of an unauthorized use. The verification may be in addition to the verification of the charger and the battery or in embodiments the charger and battery verification modules may be omitted.

The monitor checks whether the billing cycle is complete 102. The billing cycle may be based, for example, on time passed or on an amount of power or device usage. If the cycle is not complete, the system awaits 104 billing cycle completion. If the billing cycle is complete, the monitor initiates 106 billing the user. The billing may be made directly to a user account 108 or charged to a third party account.

Referring now to FIG. 5, the system can use a number of communication pathways and recharging sources. For example, a device 120 may be recharged at a residence 122 using a connection 123 power to a commercial power generator 124. Usage information may be communicated by a connection 125 to a distribution channel 126, in this case, the Internet. The device 120 may also be recharged at a public charging station 128 placed in a public

locale such as an airport 130. The charging station 128 includes a connection 131 to commercial power generator 124 and connection 132 to the distribution channel 126. In this case, the communicated information includes identification of the charging station to permit tracking of the station use and renumeration to the facilities or parties that permit and maintain the station.

The device 120 may be recharged at a mobile charging station 140, for example, on a vehicle such as an airplane 142. The mobile station includes connection to mobile power source 144 such as the vehicle power generation unit. The charger includes a link to mobile communication means such as a satellite communication link 146. The mobile communication link may be direct to the usage monitor or may be to the distribution channel 126.

The device may also be recharged at a remote charging station 150. The remote station may include its own power source, such a solar panel 152, for charging the battery. The charging station 150 also includes a communication link, e.g., satellite link, to the usage monitor or to the distribution channel.

The usage communication system can also be used without a charging station. In this case, a device 170 communicates over the distribution channel 176 or directly with the monitor. The communication link may be a wired or, as illustrated, a wireless link. The device 170 is preferably a communication device such as a telephone, pager, fax machine, computer, or personal digital assistant. Alternatively, the battery module may include a submodule that permits a communication link from the battery itself to the distribution channel or directly to the monitor. The usage information can be communicated in continuous real time.

Many other variations are possible. While usage modules have been illustrated above in connection with the battery and the charger, a usage module could as well or instead be provided in the device in which the battery is used. For example, the device may include a module with device identification, verification, communication and disable functions, while the battery includes only a battery identification module. This example simplifies the battery module.

The battery may be of various types, including primary alkaline, metal-air, or other storage-type batteries. While there are particular advantages to rechargeable batteries, the user communication systems can be used with non-rechargeable batteries. For example, a

user who utilizes the battery in a business can be provided with non-rechargeable batteries at low or no cost and the usage monitored. The billing includes a record of usage as a function of date, and/or a user-entered event. The business user can then account for the power usage for a given customer. The system can also be used with other portable power equipment including portable generators and solar powered devices. The communication from the device or battery may be information other than power usage. For example, the communication could indicate the number and type of devices in which a battery is installed. Likewise, the communication from the monitor may be other than usage based. For example, the communication may be advertising selected based on the type of devices in which a battery is used. The communication may be to one other than the user. Alternatively, communication with the user or third party may be omitted entirely. The information communicated to the monitor may be used by the manufacturer or others for analysis of battery performance and/or to obtain business data.

Still further embodiments are within the following claims.